

Test Problem for IWPCTM 11

Test problem 1: Single mode Rayleigh-Taylor with constant acceleration (gravity) in planar 3D geometry

Atwood number $A \leq 0.25$

Constant gravity = g in z direction

Choose values so flow is nearly incompressible

Perfect gas law: $\gamma = 5/3$

Use equilibrium similar to Physics of Fluids **16**, 1668 (2004)

Initial perturbation (at $z = 0$)

$$h_0/\lambda = 0.01 * [\cos(kx) + \cos(ky)]$$

$$\text{Wavelength: } \lambda = 2\pi/k$$

Zone configuration (scaled to λ)

$$\text{Domain: } 0 \leq x \leq 1, 0 \leq y \leq 1, -4 \leq z \leq 4$$

Minimum zoning: 32 in x , 32 in y , 256 in z

Periodic boundary conditions in x and y

Plot scaled velocity V_{scl} vs. scaled amplitude h / λ

$$\text{Velocity scaled to } \sqrt{Ag\lambda/(1+A)}$$

$$\text{Domain: } 0 \leq h/\lambda \leq 3 \text{ and } 0 \leq V_{scl} \leq 1$$

One plot for BUBBLE and another for SPIKE

Picture of rollups

See Ramaprabhu, et al, Phys Rev E **74**, 66308 (2006)

Results offered in text file for comparison